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David W. Lewis

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Is Scholarly Publishing Like Rock and Roll?

David W. Lewis

Dean Emeritus, IUPUI University Library

This article uses Alan B. Krueger's analysis of the music industry in his book *Rockonomics: A Backstage Tour of What the Music Industry Can Teach Us About Economics and Life* as a lens to consider the structure of scholarly publishing and how it might develop in the future. Both the music industry and scholarly publishing face disruption as their products become digital and network based. Digital content provides opportunities to create a better product at lower prices and in the music industry this has happened. Unfortunately, this has yet to happen with scholarly publishing. Similarities and differences between the music industry and scholarly publishing will be considered. Music and scholarly publishing are both subject to piracy, which threatens the revenue of established organizations, though Napster was a greater disrupter than Sci-Hub seems to be. It also appears that for a variety of reasons market forces have not yet been effective in driving changes in the business models and practices of scholarly publishing, at least not at the rate we would expect given the changes in technology. After reviewing similarities and differences, the prospects for the future of scholarly publishing will be considered.

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Correspondence: David W. Lewis, 522 Race Avenue, Lancaster, PA 17603, dlewis@iupui.edu



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IMPLICATIONS FOR PRACTICE

1. Given that scholarly publishing and the music industry are both being disrupted as the content they provide becomes digital and network based, comparing the two can provide insights into how the scholarly publishing might develop. This analysis should make clear the need to develop new business models and practices in scholarly publishing so that significant efficiencies can reduce costs. For example, something like music streaming should be possible for scholarly publishing (Strielkowski, 2017).
2. To date, market forces do not seem to have the power to force changes in the business model or practices of scholarly publishing, especially those of commercial publishers. This highlights the need for libraries to exert their influence in the market and drive change. It also suggests that it may be necessary for funding agencies, with their greater influence on researchers and publishers, to insist on change.
3. The changes in the music industry were driven in large part by the disruption caused by Napster and easy file sharing. It is not yet clear whether or not Sci-Hub, and other forms of illegal sharing, will have the same impact on scholarly publishing. If they do, new more cost effective business models are likely to arise sooner.

INTRODUCTION

In his 2019 book, *Rockonomics: A Backstage Tour of What the Music Industry Can Teach Us About Economics and Life*, Alan B. Krueger (2019) examines the economics and recent history of the music industry and outlines seven lessons he draws from it. Krueger argues that, as is the case with the music industry, digital technologies are creating superstar markets in many parts of the economy.

Joseph Esposito (2019), in a *Scholarly Kitchen* post, praises Krueger's book and goes on to say, "What Taylor Swift is to music, Google and Facebook are to tech industries—and, I believe, what Elsevier is to scholarly publishing (para. 2)." Esposito, following Krueger's lead, argues that in scholarly publishing, like music, most of the rewards flow to the few winners and the many in the "long tail" will receive little. He says, "All those seeking to create a distributed infrastructure of small entities for scholarly communications take heed. The tendency to power laws—to industry consolidation and superstars—is like the current of a huge river, which can be challenged only by the continuous injection of great and costly amounts of energy (para. 2)." A study of the consolidation of commercial scholarly publishing showing that three publishers account for 47% of the articles in the sciences and five account for 51% in the social sciences and humanities lends support to Esposito's argument (Larivière, Haustein, & Mongeon, 2015).

However, this conclusion may be overly simplistic. Scholarly publishing, while it shares many characteristics with the music industry, particularly as they have both changed dramatically with digitization and the Internet, differs in important ways from it. For example, Elsevier is not to scholarly publishing what Taylor Swift is to music, rather Elsevier is to scholarly publishing what Universal Music Group is to music. This is an important difference. Taylor Swift is the creator and performer. She, not Universal Music Group, is the superstar. There are no Taylor Swifts among scholarly authors. The market for scholarship is segmented into dozens, if not hundreds, of distinct disciplinary markets, and these scholarly markets don't necessarily cumulate to a market that will act in the way the market for music does. Each of these disciplinary markets might have a star of two, but when you consider scholarship as a whole none appears to come close to the star power of a top tier musician. Another striking difference is cost. Krueger (2019) concludes his book by noting that Americans spend less money on recorded music in a typical year than they do on potato chips. He goes on to say, "Few activities absorb as much time as music yet provide as much pleasure. What's more, the time we spend listening to music is up, while spending on music is down by 80% in real terms since 1999. A great deal has gotten even better" (p. 265–266). Scholarship may not provide the pleasure of music, but its value to society is in its way comparable. Unfortunately, while technology and changing business models have significantly reduced the cost of music, scholarly publishing has seen the opposite. If the price of gasoline had increased at the same rate as chemistry and physics journals between 1975 and 2018, in 2018 gasoline would cost \$31.63 a gallon (Odell & Maixner, 2018).

Despite these differences, and others, using Krueger's examination of the music industry as a lens to consider scholarly publishing can provide useful insights. The goal of this investigation will be to see how we might move scholarly publishing towards the increases in use and decrease in cost that has occurred in the music industry.

Krueger's Seven Lessons

Krueger drew the following seven economic lessons from his study of the music industry:

1. *Supply, demand, and all that jazz.* You would expect an economist to begin with supply and demand. Unsurprisingly supply and demand plays a significant role in the music business. This can be seen clearly when supply of a good is limited, as is the case for concert tickets. But Krueger notes that what he calls "all that jazz" also plays a role. Musicians understand that their relationships with their customers is more complex than a simple market transaction. They don't think about having customers, rather they have fans. As Krueger (2019) puts it, "You can't understand markets or the economy without recognizing when and how the jazz or emotions,

psychology, and social relations interfere with the invisible hands of supply and demand” (p. 6).

2. *Scale and non-substitutability: the two ingredients that create superstars.* When the sound, service, or product is unique you have non-substitutability, and when the top performers or firms are able to reach a large audience you have scale. Because of network effects markets of this sort create a few big winners and a long tail of less successful participants. Chris Anderson (2004) predicted that the coming of the Internet and other digital technologies would enable those in the long tail to enhance their access to the market. In the music industry, musicians in the long tail may now have easier access to markets, but their income has declined.
3. *The power of luck.* As Krueger (2019) says, “Talent and hard work are required ingredients for success, but they are not sufficient. Luck, the unpredictable, random spins of fortune that affect our lives in countless ways, is particularly important in the music industry, where tastes are fickle, quality subjective, and many talented would-be stars toil away but never get their shot” (p. 7).
4. *Bowie theory.* David Bowie once remarked, “Music itself is going to become like running water or electricity...You’d better be prepared for doing a lot of touring because that’s really the only unique situation that’s going to be left” (Pareles, 2002, para. 8).¹ This means that in the music business you need to have something unique to sell as recorded music becomes a utility. To do so requires creating products or experiences that are complementary to recorded music. This could be anything from live concerts to t-shirts. This applies not just to musicians, but also to others in the music industry, for Apple it means selling devices even as Apple Music losses money.
5. *Price discrimination is profitable.* With price discrimination the market is segmented so that those who are willing to pay more, usually for some special feature do so, and others pay less. The total take is thus increased. This can be done by charging more for good seats or a VIP experience at a concert or delaying the release of the streaming version of an album so that those who want it right away need to purchase the higher priced download.
6. *Costs can kill.* To quote Krueger (2019) again, “Making money, even a lot of money, is not a guarantee of success. Successful bands and businesses have to monitor and minimize their costs to maximize their profits” (p. 8). Krueger argues that sectors with stagnant productivity will face intense pressure to contain costs. This is the

¹ It is interesting to note that in the same article Bowie said, “I’m fully confident that copyright, for instance, will no longer exist in 10 years, and authorship and intellectual property is in for such a bashing” (Pareles, 2002, para. 7). This certainly did not happen in the music industry, so Bowie might be wrong about water and electricity as well, or he might just have underestimated the time frame.

result of what is sometimes referred to as the Baumol's Effect. Formulated by William J. Baumol and William G. Bowen, it asserts that in sectors where wages rise but productivity does not because of constraints in the nature of the work will end up having prices rise faster than other sectors (Baumol and Bowen, 1966; Baumol, 1996, and Helland and Tabarrok, 2019). The classic example used to illustrate the point is that the same number of musicians are needed to play a string quartet today as were required 200 years ago.

7. *Money isn't everything.* “Too many people confuse the underlying motivation of economic life with greed and blind pursuit of money,” says Krueger (2019), “At its best, economics recognizes that people are motivated by much more than money... Music, more than money is the tonic of happiness” (p. 9). Many musicians behave in ways that are not in their narrow economic interests, Bruce Springsteen sells all of the tickets to his concerts for the same price. The Grateful Dead encouraged bootleg recording of their concerts. Garth Brooks in his 2014–2017 tour charged reasonable ticket prices and added more shows when they sold out. Or as Tom Petty is quoted as saying, “I don't see how carving out the best seats and charging a lot of money for them has anything to do with rock & roll” (Krueger, 2019, p. 140). Music can make money, sometimes lots of it, but for many, even the superstars it is almost never just about the money. It is about creating, about making something special with colleagues, and about the energy and affirmation that comes from the audience.

Krueger's seven lessons provide a structure for comparing music and scholarly publishing. Considering the similarities and differences can provide an understanding of how scholarly publishing might or might not be reshaped.

Supply, Demand, and All that Jazz

Scholarly publishing is a broken and quirky market. The market should drive change, but it does not because the sellers are an oligopoly and they have most of the power in the market they can take monopoly rents (Larivière, Haustein, & Mongeon, 2015). Buyers have a limited ability to force changes in nature of the product or to achieve lower prices. As Lewis G. Lui puts it in the conclusion of his study of journal pricing in business and economics, “With little competition in the market, commercial publishers exercise monopoly power and maximize their profit margin at will.” (2011, p. 231).

The market is complicated because researchers, who are both the creators and consumers of the content, are not motivated by direct financial gain. In most cases the authors make little or no money for the articles they write. They also, usually gratis, do the editing and reviewing.

Researchers are motivated to enhance their reputations and by their need to achieve promotion and tenure. The supply of scholarship is driven not by demand, but rather by the scholar's desire to create, to contribute to the field, and enhance their reputation and status.

In addition, the largest consumers in the scholarly publishing market are not the ultimate users of scholarship; rather the largest customers are libraries who purchase content on behalf of their users. Supply and demand is thus mediated through a third party, who often has difficulty judging the value of a given purchase and is subject to political pressure from faculty when they disagree with library decisions.

Importantly, nearly all of the money in the scholarly publishing market, one way or another, comes from funders—governments and foundations—who pay for both the research that creates scholarship and universities, who in turn fund libraries. They are the actual, though indirect, customers of scholarly publishing. It is in the clear interest of these funders to get the maximum exposure to the work they fund and to pay as little as possible for library purchases. But until recently funders let the market function without interfering, leaving libraries to negotiate with publishers. Funders have begun to step in to insist on change, for example with the NIH Public Access policy and Plan S. Recently the Chinese government has modified its approach to publishing and how it will be supported, which among other things, is likely to constrain the level of APC funding (Toa, 2020).

What we see happening today in scholarly publishing may actually be the working of supply and demand as the ultimate customers demanding a product that meets their needs. We can see by the sellers' response, especially to Plan S, that they are unhappy (Holly, 2018 and Enserink, 2018). The interesting and important question is: will the market provide what governments and foundations are demanding, and if it does, what changes in business models and practices will be required to get a good product at a reasonable price?

Scale and Non-substitutability: The Two Ingredients that Create Superstars

The important question here is whether the scholarly publishing market is a superstar market where the money and attention go to the few, or was Chris Anderson (2004) correct when he said, "Forget squeezing millions from a few megahits at the top of the charts. The future of entertainment is in the millions of niche markets at the shallow end of the bitstream (para. 1)." When we look at the two ingredients that drive superstar markets one clearly applies to scholarly publishing—non-substitutability. Scholarly works are unique and one cannot be substituted for another. The question then becomes to what extent the second ingredient—scale—comes into play. Scholarship, like music, has a global market. Researchers everywhere can benefit from scholarly publications. However, the market for most academic work is not

large, at least when compared to music. In 2015 Elsevier had 900 million total downloads (Reller, 2016). In 2015 one artist, Drake, had 1.8 billion streams on Spotify (Iqbal, 2019). But size is less important than the distribution of demand. Does the 80/20 rule apply where 80 of the use is provided by 20% of the items or is more of the use found in the long tail? As far as books circulating in library collections it appears Anderson is wrong. A 2011 study conducted by Julia Gammon and Edward T. O'Neill (2011) by OCLC of OhioLink's 89 academic institutions found that a year's statewide circulation statistics would indicate that 80% of the circulation is driven by just 6% of the collection (p. 31), indicating a concentration of use.

Anderson's point is less about concentration of use and more about availability. That is, as content becomes digital we move from an economy based on scarcity to one based on abundance. When content was trapped in physical artifacts that were expensive and difficult to distribute only the most popular content that was available. There was no access to the long tail. Now that content is digital, everything can be made available. Anderson's point is not that the creators of works in the long tail will see many sales; they won't. Rather it is that the cumulative use of the long tail will be significant. Anderson (2004) suggests that the content in the long tail might generate more use than was available before. He cites the example of books: "The average Barnes & Noble carries 130,000 titles. Yet more than half of Amazon's book sales come from outside its top 130,000 titles. Consider the implication: If the Amazon statistics are any guide, the market for books that are not even sold in the average bookstore is larger than the market for those that are (papa. 31)." What is important to understand is that the 130,000 titles in the average Barnes & Noble store is only 0.4% of the 30 million plus title Amazon sells.² Even a large university library with two million books holds only a bit more than 5% of what Amazon sells.

Anderson has three rules for companies engaging in the digital content economy:

1. Make everything available.
2. Cut the price in half. Now lower it.
3. Help me find it.

The music industry has followed Anderson's advice. Spotify has over 50 million tracks. As noted above, people are paying significantly less while listening to more music. All of the current music services have recommendations and other discovery tools such as playlists. As Anderson (2004) says in concluding his article, "And the cultural benefit of all of this is

² It is not easy to find current figures for the number of books available from Amazon, but the commonly found answer cited on Quora is 32.8 million from 2014.

much more diversity, reversing the blanding effects of a century of distribution scarcity and ending the tyranny of the hit. Such is the power of the Long Tail (paras. 66–67).”

The scholarly publishing market is less about superstars and more about the long tail. If systems are built following Anderson’s three rules, a more diverse digital scholarly publishing ecosystem will be created and its value will be increased

The Power of Luck

Luck undoubtedly plays a role in the lives of scholars. The quirks of admissions and hiring decisions, chance encounters that lead to productive collaborations or generate novel ideas, and countless other bits of chance affect those engaged in scholarship, but the stakes are probably much lower than in music. Most scholars work in reasonable comfort whether they are relative superstars or somewhere out in the long tail. Luck is likely less important than talent and hard work.

Bowie Theory

The Bowie Theory has two parts. The first is the assertion that recorded music is going to become a utility, like electricity or running water. The second part is that given what is coming musicians need to have something besides recordings to sell. For us, the first is the more important.

It is useful to look at the recent history of the music industry and its transition to digital formats as compared to how scholarly publishing is managing a similar transition. Both music and scholarly content are born digital and largely distributed over the network. Legacy formats like the printed books and vinyl records are still in use, but the economics and markets for the digital products is what matters. Both music and scholarly content share the same characteristics that all digital objects have. They are as Andrew McAfee and Erik Brynjolfsson (2017) put it, “free, prefect, and instant.” That is: a copy can be instantaneously delivered anywhere in the world; a copy is the same as the original, and a copy can be made at zero marginal cost (p. 135–136).

These characteristics make digital objects easy to pirate. Napster, which operated for two years beginning in June of 1999, made the free acquisition of MP3 music files simple. At its peak it was estimated to have had more than 26 million unique users and was said to have taken as much as 60% of network capacity in some college dormitories (Napster, Wikipedia [n.d.]). Napster and some Napster users were sued for contributing to mass copyright violation. In addition, the music industry put pressure on universities, who in turn restricted Napster use

on their networks and threatened Napster users on their campuses. Napster was closed down in July 2001, but other pirate services continued to provide free access to music files. In 1999 global recorded music revenue was \$25.3 billion all from the sale of physical media. Revenue from recorded music declined every succeeding year until it bottomed out in 2014 at \$14.2 billion, a 43.9% decline in 15 years. Largely because of streaming revenues, revenues for recorded music increased beginning in 2015 (Jones, 2018). In 2018 global recorded music revenue was \$19.1 billion with \$8.9 billion or 46.6% from streaming (*IFPI Global Music Report*, 2019). Napster clearly broke the recording industry business model that had been based on selling albums on physical media. It was not easy to compete with free, especially when, for many users, the legalities of copyright were less important than sharing the music they loved. Napster had a second impact; the song became disassociated from the album. Users acquired not the package created by the music companies, but only the parts of the package they really wanted.

It turns out though, that you can compete with free. First with digital downloads on iTunes and then with streaming the revenues from recorded music began to recover. So how do you successfully compete with free? It is actually simple, follow Anderson's rules and create a low cost, very easy to use service. As Krueger (2019) puts it "From the music consumer's perspective, streaming converts recorded music from an à la carte menu to an all-you-can-eat buffet that is more convenient than downloading pirated music from unauthorized websites" (p. 189). Krueger notes that as is often the case with all-you-can-eat buffets people consume more, and so streaming grows the revenue pie. By the end of 2018 there were 255 million users of paid streaming services, nearly ten times the peak number of Napster users (*IFPI Global Music Report*, 2019). On-demand audio song streams increased 49% in 2018 to 611 billion streams (Music Consumption..., 2019). As Bowie predicted, recorded music has become a utility like running water or electricity.

The important question for scholarly publishing is: will Sci-Hub and other forms of illegal sharing of scholarly content be, as Napster was, disruptive enough to drive a radical shift in scholarly publishing business models?

Sci-Hub contains most of the scholarly literature. In June 2020 Sci-Hub claimed to hold nearly 82.5 million papers (About Sci-Hub, n.d.). Daniel S. Himmelstein and his colleagues (2018) found that in 2017, Sci-Hub's database contains 68.9% of the 81.6 million scholarly articles registered with Crossref and 85.1% of articles published in toll access journals. By one estimate Sci-Hub may be siphoning off a bit less than 5% of publisher's traffic (Bohannon, 2016). Sci-Hub has been sued multiple times by multiple publishers, losing each time (Schiermeier, 2017 and Chawla, 2017). While access has been restricted in several countries, as is the case with most pirate sites, there are workarounds. As the publisher suits indicate the big commercial publishers see Sci-Hub as a threat. In part this may be because the existence

of Sci-Hub and the sharing of articles on academic social networking cites like ResearchGate increases the bargaining power of libraries in their negotiations with publishers (Matthews, 2019 and Anderson, R., 2019). Correa and his colleagues (2020) found that downloads from Sci-Hub were a robust predictor of future citations and, paradoxically, Sci-Hub may thus help preserve that existing subscription business model by reducing the urgency of moving pay-walled content to open access. It is too soon to say if Sci-Hub will bring down the subscription model, but it seems possible.

If Sci-Hub forces a change in the business model for scholarly publishing, it is fair to assume that, as was the case in the music industry, that the large legacy publishers will not be able to create the new more efficient business models. They are wed to their profit margins and it is hard to imagine them giving them up. Sergio Copiello (2020) argues that for Elsevier to maintain its current revenues and profits it would need to double its APCs and article acceptance rates would need to increase by 10% to 25%. Many scholarly societies are similarly wed to surpluses from their publishing programs, often in the range of 25%, to support other activities of the society (Lewis, 2018). New entities will be needed to create the new systems and services if price are to be reduced.

As noted above governments and foundations are the ultimate paying customers and if they are willing to demand a reconfigured scholarly publishing ecosystem and to pay for it, it might happen. Whether or not Plan S is successful will be a first test.

Price Discrimination is Profitable

Price discrimination is possible when customers can be divided into distinct groups and offered different prices. The groups in which demand for the product is strong will be willing to pay a higher price than those with a weaker demand for the product. Sometimes those paying the higher price get some additional benefit, but not always. Airlines are masters at using price discriminating to fill all the seats while maximizing revenue for each flight. Scholarly journal publishers began price discrimination in the 1970s when they introduced institutional and individual prices. They moved the more extreme price discrimination with “big deals”, where each customer has their own price and is usually bound by a non-disclosure agreement from revealing it. Price discrimination also exists in the e-book market where libraries pay more than individuals. In these cases, there is no extra benefit that comes with the higher price. Libraries pay the higher price because publishers have the market power and libraries do not.

In scholarly publishing price discrimination advantages large publishers and disadvantages libraries. It is used as a means of monopoly rent seeking. Rent seeking, as Krueger (2019) nicely defines it, is, “An attempt to extract greater compensation without creating additional value

for society. In other words, rent-seekers expend resources to obtain a larger slice of the pie, while doing nothing to increase the size of the pie” (p. 219). Libraries and funders should seek to minimize price discrimination.

Costs Can Kill

One of the things that is clear about scholarly publishing is that costs need to be reduced. In the scholarly publishing market, prices have risen relentlessly, especially for science and technology journals, but for other types of content as well. The Baumol Effect is often cited to justify high prices. The argument is that the publishing, like health care or education, requires a fixed amount of labor that cannot be reduced and thus increasing productivity is difficult. But this is hard to square with the digitization of the industry, which should result in reduced costs for publications. It is also hard to reconcile with the experience of the music industry where aggressive application of new technologies and changes in business models created new profitable distribution channels. As a result, as noted above, the cost of recorded music has declined 80% in real terms in the last 20 years.

In scholarly publishing price increases have been possible because books and journal articles do not have substitutes and consumers have had little market power. Publishers therefore can and do extract monopoly rents. Price discrimination is common and prices are not transparent. As long as these factors remain in place, market forces will have a hard time forcing efficiencies on the scholarly publishing industry. The Baumol Effect may provide a justification for publishing costs, but only, because the market forces are too weak to drive the changes in business practices.

It is clear that scholarly publishing costs are unreasonably high. Let us first consider scholarly books. In a 2016 Ithaka S+R report on university press monograph publishing (Maron, Mulhern, Rossman, & Schmelzinger, 2016) found that for 382 titles published in 2014 by 20 university presses had a wide range of costs per title, from a low of \$15,140 to a high of \$129,909. A 2015 study of the costs for monographic publishing at the university presses of Indiana University and the University of Michigan and found the average price per book was \$33,813 at Michigan and \$34,590 at Indiana (Smart, Watkinson, Dunham, & Fitzgerald, 2016). These costs are for books that will likely sell as few as 200 print copies. By way of comparison, for a book processing cost of £7,000 (about \$9,300) Ubiquity Press, which focuses on academic books, will provide peer review, a core set of services, copy editing, indexing and promotion for a 100,000 word book. The book is released as an open access e-book with a print option. Royalties are paid on print sales (Ubiquity Press [n.d.]). Puncum Book publishes open access academic titles for \$3,500 (Reincke, 2018). Outside of scholarly publishing, BookBaby, the self-publishing company, will print

200 copies of a 300-page book and provide e-book files for less than \$2,000 (BookBaby, [n.d.]).

Scholarly journals are not much better. In 2013 Philip Campbell, *Nature's* editor-in-chief, estimated that the journal's internal costs were £20,000–30,000 (\$30,000–40,000) per paper (Van Noorden, 2013). In 2005, Sally Morris (2005) estimated the publish costs of a journal article to be between \$7,890 and \$10,015. Richard Van Noorden (2013) using Outsell data calculates a 2011 price per scholarly article of between \$3,500 and \$4,000. Article processing charges (APCs) should reflect the cost of publishing an article. But like the estimates cited above they vary greatly. The APC for *PLOS One* is \$1,595. For *PLOS Medicine* and *PLOS Biology* the APC is \$3,000. Hindawi APCs range from \$775 to \$2,100. The American Chemical Society APC for immediate access for non-members is \$4,000. The range of APCs for Elsevier is a low of \$500 for *Case Reports in Women's Health* to a high of \$5,900 for *Cell*. *PeerJ's* APCs are \$995 and \$1,095. In addition, *PeerJ* has lifetime memberships which range from \$399 to publish one article per year and \$499 to publish up to five articles per year (all authors need to be members). The range of cost estimates for publishing costs and APC charges is reflective of a lack of transparency and would suggest that publishers are content with existing business models and practices and charge what they need to maintain them.

APCs, particularly for commercial publishers have recently risen at rate well above inflation. Shaun Yon-Seng Khoo (2019) look at APC price increase and found, "From 2012 to 2018, APCs paid by European institutions increased from €1,173 to over €1,600, or 40%. Similarly, overall APC increases by BMC, Frontiers, MDPI, and Hindawi was 31.6%, with publisher-specific increases of between 17% and 220% (p. 8)." Khoo (2019) concluded, "This data suggests that publishers are adept at pricing journals according to the prestige value of the title and the funding available to authors in each market. Unless funders and institutions leverage their negotiating and policy-setting power to constrain costs, author price insensitivity will ensure that APC-funded open access will merely be a sequel to the serials crisis (p.14)."

It is clear that market forces have yet to put much pressure on scholarly publishers to adjust their business models or practices. Cost can kill and in scholarly publishing the damage is mostly be done to the customers—funders, libraries, and readers.

Money Isn't Everything

Like music, in scholarly publishing money isn't everything. Few academics write for the money, which is a good thing because they make very little from their publications. Aca-

demographic authors write because they feel they have something important to say and because publications and their impact are the way they are judged and rewarded.

Scholarly publishers nearly always make claims that they are serving knowledge not profit. Even Elsevier claims a lofty mission, “We help institutions and professionals advance healthcare, open science and improve performance for the benefit of humanity” (Elsevier, [n.d.]). But as profit making enterprises, commercial publishers have a fiduciary responsibility to maximize profits, and they do. So, for them, despite what they say, it really is about the money.

DISCUSSION

What Krueger’s work shows us is that an industry that is disrupted by technological change can emerge from this disruption and resume growth, but only if the industry changes. The music industry did so because widespread piracy forced new business models and practices. Physical media became unimportant and the song, not the album, became the unit that mattered. The result was streaming where listeners get access to almost every piece of music for a small fixed cost. Music is still a superstar economy, but entry into the business is more open than in the past and artists have the ability to make direct unmediated connections with their audiences.

The example of the music industry leads us to a number of questions as we consider scholarly publishing.

Question 1: What, if anything, will drive change in the scholarly publishing market?

There are three possibilities:

1. Piracy, particularly Sci-Hub, but also other illegal forms of content sharing such as content uploaded to ResearchGate or Academia.edu, will force change. Sci-Hub both contains nearly all of the of the scholarly journal literature and has an easy to use interface without the complexities needed for authentication. It seems unlikely that piracy alone will force change, but because it deprives publishers of income, thus weakening them, and provides alternatives for users that might strengthen the bargaining position of libraries, it is therefore likely to contribute to change. Piracy is however parasitic. It does not contribute to the creation of content. It can weaken the status quo, but it cannot create an alternative.

2. Libraries will become more assertive in the negotiations with publishers and get contracts that lead to a restructuring of the market. Libraries willingness to take a more aggressive position can be seen in the German and University of California negotiations with Elsevier. The Unsub tool (<https://unsub.org>), recently released by Our Research, provides the data that libraries can use to understand and justify what is involved in exiting a “big deal” (Mulvany, 2019). The recent willingness of some publishers to sign read and publish agreements indicates the publishers can be forced to adjust their business models when pressed.
3. Funders, particularly government funders such as those represented by cOAlition S, will insist on open access. Digital networked content makes open access an alternative to the subscription business model. From the funder’s perspective the widest possible distribution of the research they fund is preferable as it increases the impact of their research investment.

These three forces can, and probably will, interact and reinforce each other, and while it is not yet certain that there will be a restructure of the scholarly publish market like that that took place in music, this seems increasingly likely.

Question 2: What new business models and practices for scholarly publishing would be best from the library perspective?

There seem to be two options:

1. All or nearly all of the scholarly literature will be open access. David W. Lewis predicted that 50% of the scholarly literature would be gold open access by 2020 and 90% would be gold open access by 2025 (Lewis, 2012). This timeframe was clearly too optimistic, but his contention that open access was “inevitable” may still be true. Heather Piwowar and her colleagues estimate that in 2019 31% of all journal articles were open access and these articles accounted for 52% of article views. By 2025, they project 44% of all articles will be open access, and 70% of article views are to these open assess articles (Piwowar, et al., 2018 and Piwowar, Priem, & Orr, 2019). So, a full open access publishing system does not seem beyond the realm of possibility. The trends this study reports, which show an acceleration of open access adoption, come before the changes Plan S envisions and is pushing for, and before libraries have successfully negotiated transformative agreements with publishers. Lewis’ predictions may need to be pushed back 5 or 10 years, but it is creditable to predict that by 2030 90% of all scholarly journal articles will be open access.
2. A streaming service for scholarship, which would function like a legal Sci-Hub and follow Anderson’s three rules: provide everything, at low cost, and help me find

want I want. This is the experience libraries attempt to create using discovery layers, link resolvers, and the like, but the technical complexity of authentication and the need to tie many content provider's systems together makes duplicating the Sci-Hub user experience impossible, and providing access to everything is a financial challenge for even the most well-resourced libraries. ReadCube (<https://www.readcube.com/home>) appears to offer a service that approximates a streaming service, though it does not appear to have gotten much traction. The point of a streaming service, comparable to what exists in the music world would be, not just a technical solution, but most importantly the price needs to be in the range of music streaming services, say \$10 per month, and for this price an unlimited number of articles needs to be provided. The key feature of a streaming service is that it is an all-you-can-eat buffet.

Question 3: How might business models and practices be restructured?

This is hard to predict, but here are a few options:

1. Apply AI to publication processes. Meta, a machine learning system that is now a project of the Chan Zuckerberg Initiative, claims that, “Bibliometric Intelligence outperformed tens of thousands of human editors by a factor 2.5x at predicting article-level impact for new manuscripts, prior to publication. It also performed 2.2x better than the same group of editors at identifying ‘superstar articles’ – those that represent the top 1% of high-impact papers, prior to publication” (Aries System, 2016, para. 4 and Yang, Vembu, Adawi, & Shai, 2016). The Danish company UNSILO has also developed AI tools to assist in the publication process. David Worlock, a publishing consultant, said after seeing a demonstration of UNSILO's system, “It doesn't replace editorial judgement but, by God, it makes it easier” (Heaven, 2018, para. 7). Peer review is generally thought to be slow, unreliable, and costly. Applying AI applications to at least the initial review cannot help but improve it and reduce publishing costs.
2. A more radical reconstruction for the process of article publishing has been proposed by Michael Eisen, one of the founders of PLOS and now Editor in Chief at eLife. He says:

I think journals are an anachronism—a product of the historical accident that the printing press was invented before the Internet. I want to get rid of them. More specifically, I want to get rid of pre-publication peer-review and the whole “submit–review–accept/reject–repeat” paradigm through which we evaluate works of science and the scientists who produced them. This system is bad for science and bad for scientists (Vines, 2019 para. 2).

He proposes that scientist deposit their articles in subject repositories like ArXiv or bioRxiv and an editorial process of some sort would select and review papers from these repositories and tag them in some way. Kent R. Anderson examined bioRxiv and found that 30% of the preprints uploaded to the repository remained unpublished (Anderson, K.R., 2019). Anderson viewed this finding as a sign that bioRxiv was not serving its intended purpose, but this finding is actually an indication that the system is functioning as Eisen would want. The free online archive bioRxiv makes many studies available and preserves them without the expense of full publication, and many of the unpublished papers in bioRxiv are cited and discussed in social media (Fraser, Momeni, Mayr, & Peters, 2020).

3. The scholarly monograph needs to be rethought. Spending \$25,000 to \$40,000 for a book that sells only a couple of hundred copies is a waste of resources. Lower cost open access options, like those offered by Ubiquity Press, should become the standard. Getting scholars, particularly in the context of promotion and tenure, to accept open e-books will probably mirror the debates that have gone on about open access journals. In the end, the increase in impact and citations will likely carry the day, but getting here will be contentious.
4. Expand the use of open publishing infrastructure. Systems like the Open Journal System (OJS), which has been in existence since 2001 currently supports over 10,000 journals. Many academic libraries host OJS and support journals, usually at no cost. The Public Knowledge Project, the parent organization of OJS will host a journal for as little as \$850 per year. Systems like it could be more heavily used, especially by small scholarly societies and similar groups migrate their journals from subscription to open access.

Question 4: How much money might be saved if publisher profits were reduced?

In 2018 Elsevier revenues of £2,538 million or \$3,375 million³ and an adjusted operating profit of £942 million or \$1,253 million for a profit margin of 37.1% (RELX, 2018, p. 18). Springer Nature had 2018 revenues of £1,660 million or \$2,208 million (Springer Nature, 2019). Aspesi reports Springer Natures operating margins at 22.8%, which would mean their 2018 profit would be \$503 million (Aspesi, 2019, p. 21). Wiley reported a 2018 revenue of \$1,796 million and a profit of \$275 million for a profit margin of 15.3% (John Wiley & Sons, 2018, p. 18). The reported profits for successful magazines are 12–15% (Buranyi, 2017). This is clearly speculative, but if margins for Elsevier, Spring Nature, and Wiley in 2018 had been in this range of successful magazines, approximately

³ Calculated at 1.33 pounds to the dollar.

\$1 billion would have been saved. This makes reforming the system well worth the effort. The failure of the Springer Nature initial public offering (IPO) may indicate that publisher's margins are under pressure. Claudio Aspesi explains the Springer Nature IPO failure, "Very simply, the IPO of Springer Nature failed because of a valuation issue. The price range offered to investors (€10.50 to €14.50/share, equal to \$12.17 to \$16.80/share implied a valuation of 8.8 to 12.2 times 2019 forecasted EBITDA.⁴ This assumes that 2019 EBITDA will come in at about €600/\$695 million (an almost 10% increase over the €551/\$639 million EBITDA recorded in 2017)" (Aspesi, 2019, p. 22). Simply put, Springer Nature's projected profits did not justify an investment at the hoped for share price. The market was skeptical of Springer Nature's ability to generate the profit margins it had generated in the past. From the library perspective this is a positive sign that could be an indication of a decline in the market power of commercial publishers.

CONCLUSION

In 1999 when Napster began disrupting the music business few in the music industry would have predicted iTunes or the iPod, though clearly some at Apple were working on them. Even harder to imagine would have been streaming music services. We can expect the disruption that is underway in scholarly publishing will be traumatic, as it was for the music industry. We should expect the disruption to take place in promotion and tenure committees as well as in publishing houses. In the end, it is likely that costs will come down and processes will become more efficient. It would be surprising if the dominant publishing firms of today will emerge on top a decade from now. Universal Music Group does not run a streaming service. The large commercial firms will similarly be unlikely to respond to the coming disruptive changes in scholarly publishing.

What will be paid to publish scholarship and how the money flows can also be expected to change. As it does today the funding for scholarly publishing will largely come from governments and foundations. Whether most of it will flow through libraries, as it does today, is an open question, though library hosting and publishing of locally produced content will likely increase.

It took the music industry 15 years to recover from the digital disruption that began with Napster. It has been 8 years since the founding of Sci-Hub, and the disruption in scholarly publishing is moving at a slower pace, but with Plan S and more libraries walking away

⁴ EBITDA stands for earnings before interest, taxes, depreciation, and amortization, and is a useful metric for understanding a firm's ability to generate cash flow and for judging a company's operating performance.

from “big deals” and negotiating transformative agreements, it seems that disruption is accelerating. Alternative business models and processes are emerging even if they are not yet widely used. It is likely that the next decade will be one of great change ending, hopefully, with all scholarly content following the lead of recorded music in being cheaply, and easily available to everyone who has need for it.

So, is scholarly communications like rock and roll? We can only hope so.

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